Consumer-Oriented Insect Research

People sometimes ask why ARS works with cockroaches. "After all, cockroaches don't have anything to do with agriculture, do they?"

Well, no, not if agriculture is defined as crops in a field. But agriculture is also the harvested crop on its way to processing plants, supermarkets, and homes. From this perspective, cockroaches have much to do with agriculture. Millions of dollars are spent annually on treatments and packaging to keep these and other pests out of our food supply.

Cockroaches also have been incriminated in the spread of disease. They harbor *Salmonella* and other pathogens and have been suspected of carrying microbes that cause typhoid fever, staph infections, and even polio. Plus, the National Institute of Allergy and Infectious Diseases estimates that 10 to 15 million Americans are allergic to cockroaches.

The need to cut back on toxic chemicals makes cockroach control a greater challenge for researchers who, in response, have turned to new weapons—including computers. A story in this issue describes new software that reveals which areas of a structure need pesticides—and which don't. The result: less chemicals used to kill more roaches.

ARS has a 50-year track record of successful, large-scale assaults against insect pests. This work began at the same ARS location that produced the new cockroach software—the Center for Medical, Agricultural, and Veterinary Entomology (CMAVE) in Gainesville, Florida, which originated during World War II. Its first mission: protect U.S. troops from disease-bearing insects. Military strategists knew that historically, far more soldiers had died from bacteria than from bullets.

One result of the research was deet—still the primary chemical people use to protect themselves from mosquitoes.

Most of the early work was aimed at controlling mosquitoes around military installations that often had houses, offices, schools, recreational buildings, parks, and warehouses. Later on, their similarity to cities and suburbs gave researchers a headstart on new technologies to control insects in those nonmilitary areas.

While much mosquito control is handled by regional or municipal abatement districts, cockroaches are seen as the home dweller's problem. Since the mid-1980s, many cockroach controls marketed for use in homes and commercial establishments have been based in part on CMAVE research, including *Combat*, *Avert*, and *Max*.

During World War II, the facility's scientists were mainly livestock entomologists—the field of medical entomology had not yet evolved. Today, CMAVE's researchers have backgrounds in immunology, toxicology, biochemistry, mechanical and electrical engineering, chemistry, and nutritional ecology. This critical mass of expertise produces baits that insects find impossible to resist and artificial diets to lab-rear pests for experiments. Engineers at the lab design sensing equipment for new insect-monitoring systems that run on software written by computer specialists.

The ARS researchers at Gainesville work closely with colleagues at other federal, state, and private laboratories. Collaborators include the Department of Defense, Environmental Protection Agency, Food and Drug Administration, National Aeronautics and Space Administration, University of Florida, Johns Hopkins University, and many others, including private sector companies with which ARS forms cooperative research and development agreements.

ARS—at Gainesville and other locations—has taken on many seemingly intransigent pests over the years. This is why the agency continues to be regarded as a crucial line of defense against pests that threaten our food supply, health, environment, and economy.

Most Americans have never heard of screwworms, the only insects known to eat the flesh of living mammals. But 50 years ago, the pests cost the U.S. cattle industry millions of dollars in losses each year. Now they have been eradicated from the United States and Mexico through an ARS-devised program in which sterile male screwworm flies are released to mate—fruitlessly—with females; as a result, the pest's population collapses.

In the mid 1980s, Lyme disease appeared in the Northeast, transmitted by an organism carried in deer ticks. Recently, ARS was charged with finding ways to control ticks on millions of wild white-tailed deer. Agency scientists have already identified nematodes and fungi that attack the tick and are testing feeding stations where wild deer rub control compounds onto themselves.

The agency's latest challenge is the Formosan subterranean termite. This wood-chomping pest entered the United States after World War II and now causes over a billion dollars in damages annually in the South. It even threatens to destroy New Orleans' cherished French Quarter. This year, ARS formed a coalition of federal, state, local, industry, and nonprofit partners to confront the threat.

Based on the agency's track record, the termites could be in for a surprise.

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